International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169
Volume: 5 Issue: 6 525 – 531

Light Monitoring on a Management Tool

Naveena. Anumala
School of Computer Science &Engineering
VIT University, Chennai
naveenaanumala868@gmail.com

Guide: Dr. R. Kumar
School of Computer Science & Engineering
VIT University, Chennai
rangaswamykumar.r@vit.ac.in

Abstract:- The objective of this paper is to propose a new design for outdoor lighting system. India is one of the biggest country and the process of lighting infrastructure is handling by humans. Maintenance ofthe infrastructure is facing problems at the time of repairing and updating the process of street lights. The main gist of this paper is to control the lighting infrastructure by servers (monitoring servers like nagios,icinga)and developing a remote management tool(RMT) for the people to access details about street lighting. And the users can leave the notifications, messages, and updates about the lighting through remote management tool. By the reference of the notifications, messages and weekly analysis of the lighting workflow required actions be taken.

Keywords: *outdoor lighting, monitoring sever, RMT (Remote Management Tool).*

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I. Introduction:

The light monitoring on management tool is a software platform for outdoor lighting. The aim of this paper is to link the lighting assets with monitoring server and controlling be done by citizens in the city.

I-(i).Connect application: By this application citizens get connection with the lighting infrastructure & can control the lighting process. These citizens get connection to the server (monitoring tool) through remote management tool (RMA)and can give the suggestions like where they need more lighting & where less.Citizens are allowed to set the custom lighting and dimming schedules like less light in business streets on weekend times. Server checks metadata of lighting system and sends the notifications, updates to the respective nearest operator.

I-(ii). Workflow application: By this application weekly analysis of the lighting assets be designed in efficient manner. Lighting infrastructure be implemented in the form of pie charts and bar graphs for better understanding.

Main contents:

1. Managing the street lights: Street lights be managed remotely. They responds to changing need by activating, deactivating or by adjusting brightness of lights. By this remote managing system light energy be get save. Initially light levels of the streets be adapted. Through the connect application (remote management tool), clients allowed to send notifications, messages and updates about the lighting. On the basis of notifications get from the clients lighting schedules be sets. These changes should help to improve safety and visibility of light levels.

2. Monitor the luminaire status: Status of individual luminaries will be get noted. These monitoring consists of failure notifications from street lights automatically and have the access to latest status updates on lighting infrastructure. These monitoring is helpful at the time of repairing crews to improve operational efficiency.

3. Measuring the energy usage: Tracking and evaluating the amount of electricity consumption of the street lights. By the workflow application using the measurements of the energy usage, weekly analysis be evaluated. The measurement graphs be constructs either in pie charts manner or in bar graphs manner for better understanding. These data graphs are helpful to calculate electricity savings of lighting, breakdowns of energy usage including historical data.

Benefits by measuring the energy usage:

- To increase transparency
- To improve decision making ability..
- To understand the energy usage measurements deeply.

II. Literature survey:

II-(i). Provoking the city—touch installations for urban space Heidi Tikka a, Sandra Viña a, Giulio Jacucci b & Teemu Korpilahti
(2011, Vol. 22, No. 3, pp. 200–214): Explained the need of multi-touch screen. This paper describes the development of the narrative concept at hand. Public multi touch screens become the part of urban informational infrastructure. At hand sets out to explore the possibility of an interactive narrative event which incorporates the city space, the multi-touch screen as a representational and performative medium, and the series of gestures associated with multi-touch. These

public multi touch screens are designed to increase the awareness about multi touch screen in the people.

Multi-touch gestures are directly related to the operations of managing documents, there is very little space left for conceptualizing touch in terms of one's phenomenological relationship to the other.

II– (ii). Internet of Things for Smart Cities by Binder, T. and Redstro¨m, J. (2012, Vol.18, No.2, pp.186-197): This paper discussed the internet application uses in smart cities. Citizens browse the specific area in the maps where the problem raised. The notifications or problems raised by the citizens be get noted in the server.

Using GPS specified area's location be traced and inform the problem to nearest operator. Depending upon the notifications got by the server operator takes care of the raised problem.

II-(iii) Survey Paper on City Touch http://www.lighting.philips.com/main/systems/connected-lighting/citytouch.html): This document consists how Philips company developed lighting projects in other countries. And consists brief description about the lighting processing infrastructure inlos angles (how citizens are controlling the lighting process by mobile applications).

This application offers a wide range of connectivity options. This application is mainly implemented in three different ways:

- Ready luminaries
- Connector node
- Connector kit

1. Ready luminaries: These ready luminaries are true plug and play solutions. Once installed, the luminaries connect automatically to the application system, upload their location and technical data. And these luminaries transmits the operational information of the street lighting.

Key advantages of using luminaries in application:

- **Automatic commissioning**: No operator action necessary. Luminaries automatically connects to the installed system.
- **Automatic location:**These are auto located on the map, and consists of GPS integrated solutions with all assets data.
- **Automatic data upload:**All luminaire data updates are straight to the system of CityTouch.

2. Connector node: In this method installation consists of simply plugging a lightweight connector node into a standard socket on the top of an existing street light. The connector node transmits location and operational information via mobile network.

Key advantages of using connector node in the application:

- **Automatic commissioning:** Each node automatically connects to the system by one click.
- **Automatic location:** These are auto located on the map, and consists of GPS integrated solutions with all assets data.
- **Automatic status feed:** Transmits all the operational and status data directly and automatically to the lighting operator.

3. Connector kit: The connector kit fits within the width of pole and requires a single drilled hole. In this method the connection of all luminaries to the system by simply mounting the compact connector kit to the luminaire pole. These connector kit works with the street lights of manufacturer. These connector kits transmits location and operational information via mobile network.

Key advantages of connector kits:

- **Automatic commissioning:** luminaries connects automatically once installed.
- **Automatic location:** These are auto located on the map, and consists of GPS integrated solutions with all assets data.
- **Upgrade the existing luminaries:** Connects to all existing luminaries in the infrastructure.

III. Proposed work:

III - (i). Architecture: The outdoor lights be connected to the main server (monitoringserver) through connector kits. These connector kits be designed to access operational information & to transmit its location. Through the connector kits collected operational information assets of street lights be get noted by the monitoring server.

By monitoring server:

1. The street lights be managed remotely (responds to changing the needs by activating, deactivating the brightness of street lights).
2. Monitor the status of lighting (monitorthe whole infrastructure by automatic failure notifications, repairs & latest updates to increase operational efficiency).
3. Measure energy usage (the assets of lighting like energy efficiency, energy usage be represented in the form of bar graphs).

By the citizens (clients):

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1. Citizens access the remote management tool (RMA) to get the lighting information.
2. Allowed to set the custom lighting and dimming schedules.
3. Sends reviews about the lighting maintenance in the city.
4. Sends notifications and suggestions like less light in business streets on weekend times.

This monitoring server and customers (clients) communication happens by the connect application. The remote management tool which uses for connection consists of GPS technology. This RMA (Remote Management Tool) access the location of the street lights using GPS technology. And the connector kits which are fixed in every street light access the lighting assets of that particular street light.Through this RMA,clients can give suggestions about the lighting like where they need more lighting &where less. And the changes be done in order to increase the operational efficiency.

III (ii). Implementation details: Monitoring tools (like nagios, icinga) be used to control the whole lighting infrastructure. Monitoring tools act like servers to the lighting part and these servers access the operational information assets from the clients which consists linking to the street lights by connector kits.

The connector kits are fixes on the top of street lights, these kits consists of the GPS technology. By this GPS technology location of street lights be get noted. So at the time of repairing it's easy to find out the location of that particular street light. And updating, changing the assets of lighting be also become easier.

III (ii) – i . Server architecture:

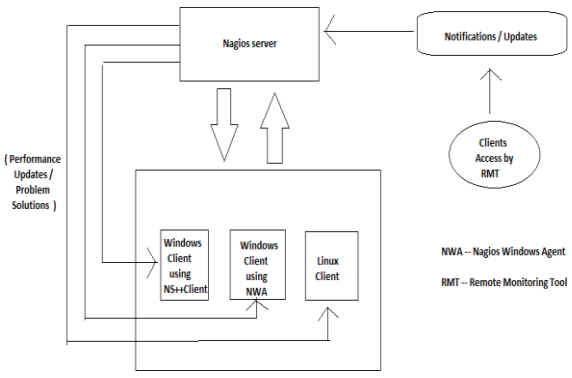

Figure 1: Nagios server architecture

Nagios server is an open source application (computer software application) which monitors systems, infrastructure and networks. Nagios offers alerting and monitoring the servers, services and applications. It alerts the users who is working on this application when things go wrong. And alerts them when problem has been resolved.

Nagios server (implements in linux operating system) consists clients of windows and linux operating systems. Windows client can be add to the server by two ways

- By NSClient++
- By NWA (Nagios Windows Agent)

And the linux be added by the Nagios Linux Agent (NLA).

Different types of Nagios agents:

1. NRPE:NRPE stands for Nagios Remote Plugin Executor is one of the nagios agent which allows monitoring of remote system using scripts. It allows for monitoring of different resources like system load and disk usage. NRPE uses for to execute plugins of nagios on other Unix/Linux machines. And this NRPE can communicates with windows agents addons also.

2. NRDP:NRDP stands for Nagios Remote Data Processor is one of the flexible processor of nagios agent. This architecture is easily extendable and customizable. NRDP works on the protocols like HTTP, XML, and uses standard ports.

3. NSClient++:NSClient++ is mainly uses to monitor windows operating systems. Once NSCilent++ installedon remote system, it listens to protocol TCP of port no – 12489. Check-nt be the plugin which collects the information from the addons. NSCilent++ monitors the private services like memory usage, disk usage, load on CPU and running processes.

4. NCPA:NCPA stands for Nagios Cross Platform Agent. NCPA can install in Linux / Unix, Mac OS and in Windows operating systems. NCPA monitors memory usage, CPU usage, processes, disk usage, network usage and services.

NCPA consists of two main parts:

- Active checks are sent through "NCPA Listener"
- Passive checks are sent through "NCPA Passive"

III (ii) – ii . Internal architecture of server & client:

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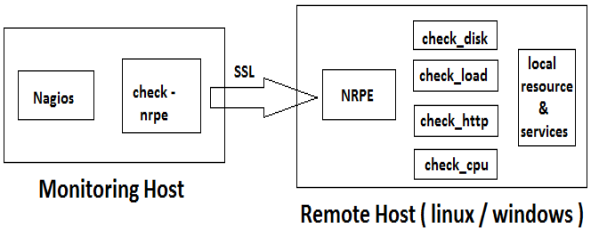

Figure 2: Server &client communication

NRPE (Nagios Remote Plugin Executor)provides the nagios plugins on Linux / Unix machines.

NRPE addon consists two contents:

1. Check_nrpe plugin : resides on local monitoring tool
2. NRPE daemon: runs on remote Linux / Unix machines. NRPE daemon runs the appropriate Nagios plugin to check the service or resource.

These results of the service or resource checks are passes from NRPE daemon back to check-nrpe plugin.

III (ii) – iii. GPS location tracking of the street lights:GPS stands for "Global Positioning System" use to track precise location. By the tracking unit recorded data be stored in database. Assets of lights be stored in the database by the sensors technology.

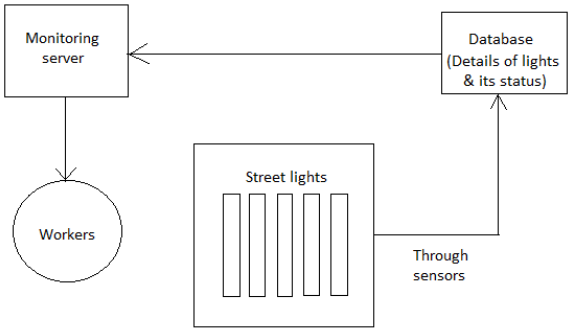

Figure 3: Connection of lights to the server

IV. Work done so far &results:

1. Turning on smart grid (light) by passing the command

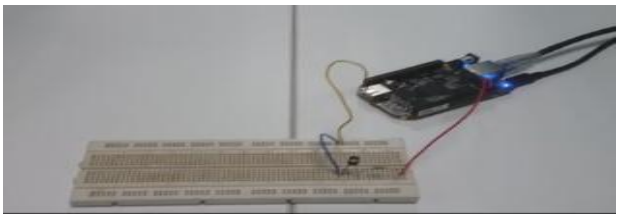

Figure 4: Light turning on

2.Turning off smart grid (light) by passing the command

Figure 5: Light turning off

3. Displaying status of smart grid on dashboard

Figure 6: dashboard

4.Installing nagios in linux and setup the infrastructure

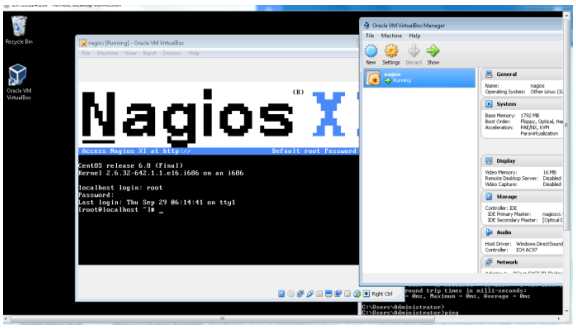

Figure 7: Nagios installation

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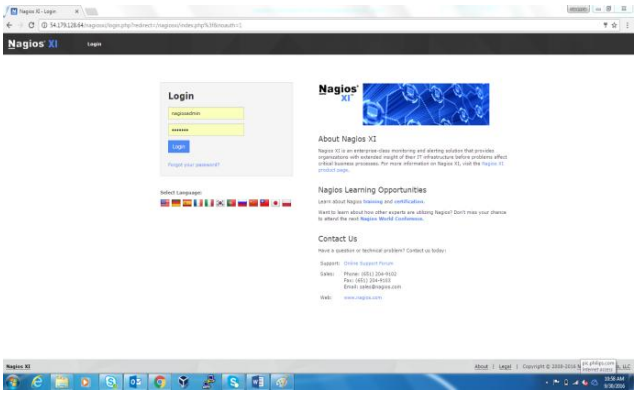

Figure 8: Nagios login page

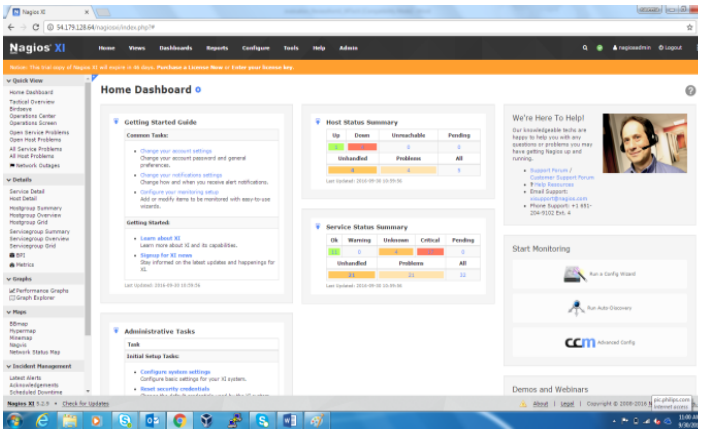

Figure 9: Nagios dashboard

5. Setup the server in nagios dashboard

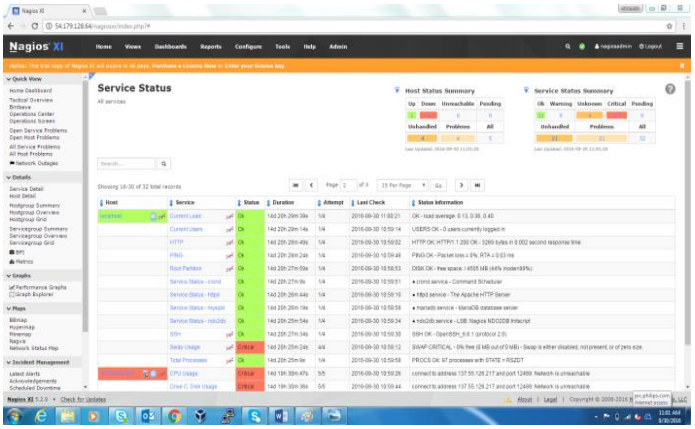

Figure 10: Local host (linux- nagios)

6. Adding clients to the server

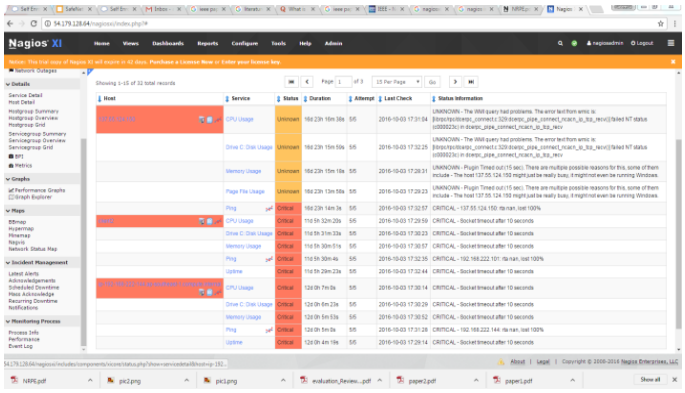

Figure 11: Windows and linux clients

7. Event updates, notifications and performance

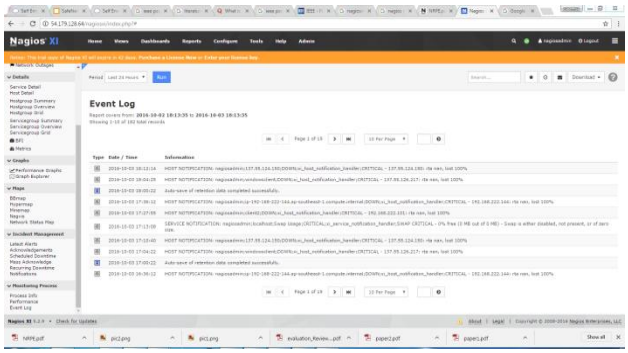

Figure 12: Performance, notifications bar

8. Location finding login screen

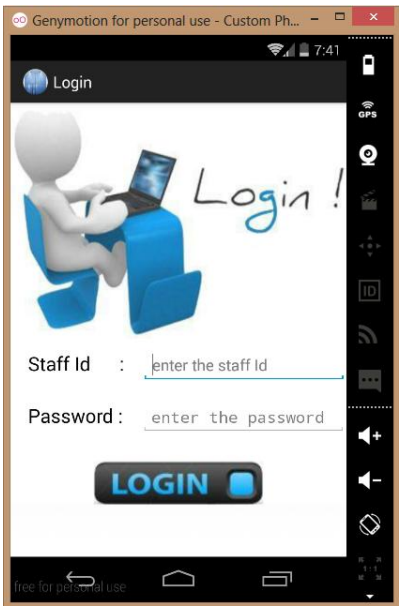

Figure 13. Login screen

9. Dashboard of location finding application

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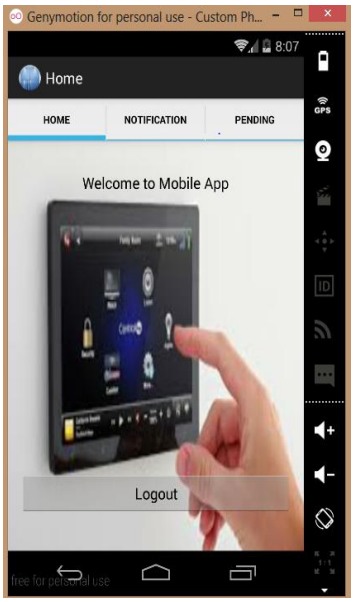


Figure 14: Dashboard of application

10. Details of the light – location of light (latitude & longitude), status of light

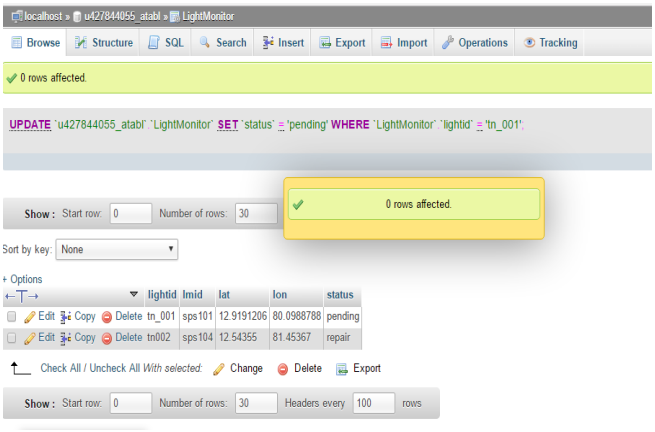


Figure 15: Details of lights

11.Effect on data by changing the light details

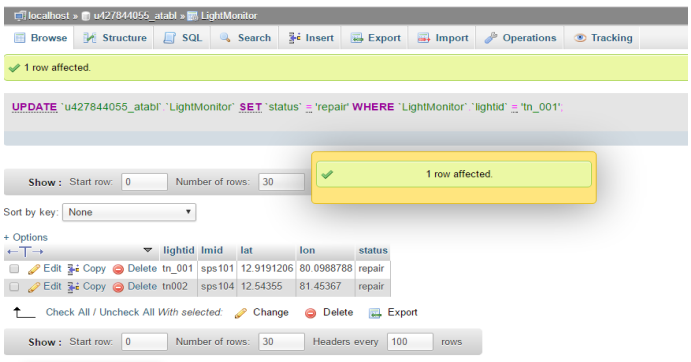
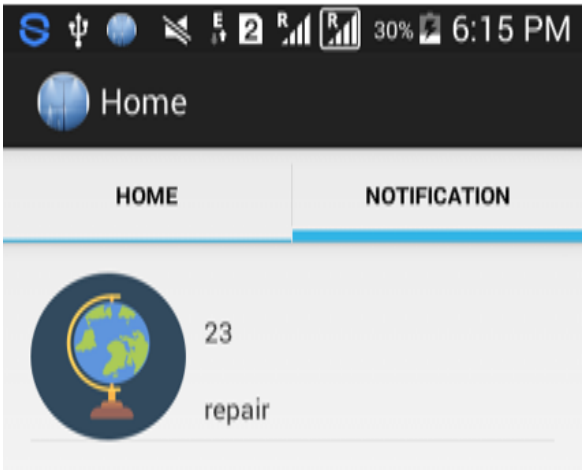


Figure 16: Changes in data

12.Notifications getting on the screen about the working of light



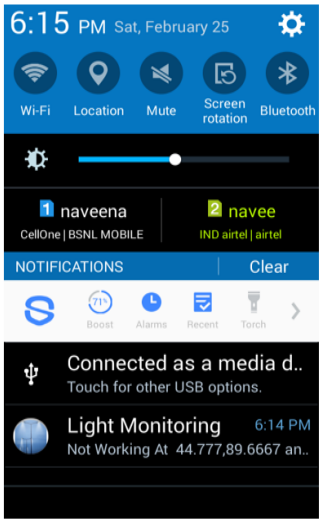


Figure 17: Notifications about the light status

V. Challenges:

1. Nagios is one of the monitoring tool which consists of some limitations, these are some of the challenges where performance face problems

- Nagios is an un-user friendly GUI
- Lack of performance and database
- Configuration problems
- Lack of automatic device discovery

2. The connector kits are responsible for noticing lighting assets of street lights. So at every particular period of time checking should be happen on those performances.

3. Should be careful at the time of changing lighting assets depending on performance and reviews got from clients (the changes should not show any side effects on working process).

4.Changes on the processes must show the growth.

VI. Conclusion: By this light monitoring project, handling of lighting infrastructure becomes easy. Using this process human interaction required to handle the lighting infrastructure get reduces. And through this citizens can get contact with the street lighting. The infrastructure becomes user friendly.

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